Climate Change and Human Health Literature Portal

National Institute of Environmental Health Sciences

Predicting the emergence of tick-borne infections based on climatic changes in Korea

Abstract:

Granulocytic anaplasmosis (GA) and monocytic ehrlichiosis (ME) are maintained in wild rodent reservoirs and tick vectors in the Republic of Korea. This study investigated the prevalence of 2 tick-borne pathogens, Anaplasma phagocytophilum and Ehrlichia chaffeensis, in wild rodents and ticks in central Korea to identify any significant associations with existing or changing climatic conditions. Specifically, the goal of this study was to develop simple models for the probability of occurrence of an epidemic of GA or ME as a function of climate in an area in a given year. Climatic data from 2 regions, Munsan and Dongducheon, Gyeonggi, in central Korea (between the Demilitarized Zone and Seoul, latitude between 37 degrees N-38 degrees N and longitude between 127 degrees E-128 degrees E), were analyzed with respect to the prevalence of GA and ME in Paju, Yoncheon, Pocheon, and Dongducheon for the period from 2001 to 2005. Rates of A. phagocytophilum and E. chaffeensis decreased as the total yearly precipitation levels and daily humidity increased, and as the daily mean sunshine hours decreased. Rates of A. phagocytophilum and E. chaffeensis from rodent ticks and rodents increased in the fall season. Linear regression analyses evaluating the numbers of positive samples by sample type found that rodent ticks were 6.64 times more likely to be actively infected with A. phagocytophilum than grass ticks or rodents, though the likelihood of any samples testing positive for this pathogen decreased by 0.17 as the annual mean level of precipitation increased by 1 mm. For E. chaffeensis, rodents were 15.67 times more likely to be infected than ticks. Logistic regression analyses evaluating each sample separately found that the odds of infection with A. phagocytophilum were nearly 5 times greater for rodents than ticks. In these analyses, precipitation was one potential factor to account for the prevalence of tickborne diseases.

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Resource Description

Early Warning System: ⊠

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure : ⊠

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Meteorological Factors, Precipitation, Solar Radiation, Temperature

Temperature: Fluctuations

Geographic Feature: ☒

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☒

resource focuses on specific location

Non-United States

Non-United States: Asia

Asian Region/Country: Other Asian Country

Other Asian Country: South Korea

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Tick-borne Disease

Tick-borne Disease: General Tick-borne Disease

Mitigation/Adaptation: ☒

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☒

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☒

format or standard characteristic of resource

Research Article

Timescale: ☒

time period studied

Short-Term (

Vulnerability/Impact Assessment: ☒

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content